

ON THE ADULTERATION OF BRANDY.

BY R. MARLOTH, PH.D., M.A.

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THE subject of the adulteration of brandy has been ventilated in the Colonial newspapers from time to time, not only here in Cape Town but also elsewhere. During my stay at Kimberley, about eighteen months ago, I read there similar complaints about the injurious properties of the brandy, to those which I had heard here.

It seemed to be the general opinion that most of the canteen-keepers were dangerous compounders of poisons, who took the brains out of the unsuspecting natives by means of blue-stone, oil of vitriol, tobacco-extract or cayenne pepper.

I thought it therefore worth while to investigate the question and procured four samples of brandy, but having there no analytical apparatus at my disposal, I took the samples with me to Cape Town. This was in the beginning of 1886.

Another journey however, which took me from Cape Town for several months, prevented me from taking up the postponed analysis; and when I returned from the interior, the subject had slipped out of my mind.

It was only about February last, when some remarks in the newspapers reminded me again how desirable it was to ascertain the nature of the virulent poison that was maddening the stalwart Kafir in the streets of Kimberley and the jolly sailor who landed on our shores.

I employed a common workman for the purchase of the samples, which were taken from different canteens of the town. Up to the present I have analysed twenty-four samples of brandy, four from Kimberley, bought there last year, and twenty from Cape Town, bought during the months March, April and May.

I may state at once that none of these samples contained any foreign ingredients detrimental to health. My investigations confirm therefore the results which were obtained at the Excise Department by the examination of forty-seven samples of brandy, and we

may therefrom draw the conclusion, that very little, if any at all, adulteration of brandy takes place in our canteens,—adulteration at least in the restricted sense of the word as we use it out here, alluding only to the addition of health-destroying materials.

Although the brandies which I have analysed did not contain any artificially added poison, I cannot consider them to be a harmless drink. Harmless I mean of course without regard to the effects which the alcohol itself has on the consumer. The majority of the samples contained a considerable amount of fusel-oil, agreeing in this respect with those which have been examined by the Excise-officer.

To prevent any misunderstanding, I may be allowed to consider in greater detail this unpleasant body, the fusel-oil.

The alcoholic fermentation is often described as the splitting up of sugar into alcohol and carbonic acid, effected by the action of some living vegetable cells, commonly called the "yeast." But this is a very rough and incomplete definition of the process, which is not at all such a simple one. On the contrary it is a very complicated matter, the attempt to explain which has given rise to many theories, and which is yet far from being fully understood. We know that whenever such fermentation takes place a considerable number of other chemical substances are formed, 94 per cent. only of the sugar present in the liquid is—as Pasteur has shown—transformed into alcohol and carbonic acid, the other six per cent. supplies the material for the formation of the accompanying substances. The principal by-products are glycerine, succinic acid, some compound ethers, as for instance acetic ether and several other alcohols. In chemical language the name alcohol comprises a whole class of substances which are composed according to a similar formula. The five first members of this series are the methyl, ethyl, propyl, butyl and amyl-alcohols.

Speaking generally however of "alcohol" we always mean the second of the series, the ethyl-alcohol, just as we use the word "salt" in a specific sense, although there are thousands of different salts known to the chemist.

There seems to be a widespread opinion, that the nature of alcohol differs according to the material it is made from. That is a misunderstanding of long established facts. The alcohol is exactly the same in all the fermented and distilled liquors, chemically and physically. It is the same substance that men are eager to produce.

in their alcoholic beverages all over the world, whether they ferment the sap of the African palm or the milk of Caucasian mares, whether they distil it from the grain that grows in the valleys of Scotland, from the potato of the German plains, or from the noble grape on the banks of the Charente in the West of France and on the hills of the Paarl in our neighbourhood. It is always this ethyl-alcohol ($C_2 H_4 O$.)

The difference of the various products lies only in the accompanying substances, and as far as the distilled spirits are concerned, only in the bouquet.

What is the bouquet? you will ask. It is a very variable, very delicate and complicated thing, and I can name here only a few of its constituents. You will remember that during the fermentation all the chemical compounds, which I mentioned, are formed. Their relative proportions and absolute quantities vary considerably, according to the fermenting liquid and the character of the fermenting agents, the yeast. Also here cleanliness is of the highest importance. The purer the ferment itself, the purer is also the product. Recent investigations with carefully prepared ferments (yeast) have shown that it is possible to obtain almost pure alcohol, which is not accompanied by any fusel-oil at all.

This portion of the by-products of fermentation, namely the volatile ethers and acids, pass easily over during the beginning of the distillation; the glycerine and the succinic acid, being not volatile, remain of course in the still with the refuse-wine, and the other alcohols with a much higher boiling point than ethyl-alcohol, should equally remain in the still. But they do not, just as water evaporates already much below its boiling point, in fact at all temperatures and even in its solid state, as ice or snow, so these alcohols are volatilized with the vapours of the ethyl-alcohol and water. Their quantity in the products will of course depend on the amount that was present in the original liquid and on the care bestowed upon it during the distillation. The three alcohols with a higher atomic formula than the ethyl-alcohol form principally the compound which is called "fusel-oil." The fusel-oil of the wine is different from that of the grain and this again from that of the potato, but they all contain these alcohols in various proportions.

It is a fact which has long been known, that fusel-oil is highly injurious to health, and especially that of the potato has always been noted as the most objectionable one of the family, but only recent experiments have shown the reason for these facts.

It was Professor Dujardin-Beaumont in France, who ascertained the effects of these alcohols on dogs. The results of his experiments establish the highly interesting fact, that the higher in the series an alcohol stands the more toxic it is, and the degree of toxicity follows almost in a mathematical ratio the *atomic formula*. He has determined the medium toxic dose for the various alcohols, calculated on the weight of the dog and reduced to a unit in kilogrammes, and he obtained as the result the following series: Ethyl-alcohol, 7.75; propyl 3.75; lenty, 1.85; amyl, 1.5. You are, of course, aware of the fact that the alcohol contained in brandy or wine or elsewhere is a poison. There is a toxic dose for alcohol just as well as for strychnine. It has happened often enough that a man has been killed by taking too large a dose of spirits. The toxic dose for dogs being 7.75 grammes for each kilogramme of weight, a terrier, weighing for instance five pounds, would require one ounce of ethyl-alcohol to be killed. But in giving him propyl-alcohol, which is the first of the fusel-oil series, half an ounce would produce the same effect, whilst the amyl-alcohol would do it already with 90 drops, being more than five times as toxic as the ethyl-alcohol. The latter is, you remember, the alcohol *par excellence*, the former with five atoms of carbon is *the* fusel-oil "par excellence." It is this alcohol which forms the main portion of the potato and grain fusel oils, and therefore the obnoxious properties of rude potato and grain-spirits are easily understood. The spirit carefully distilled from good wine contains very little of these more toxic alcohols, but in spirits from badly fermented wine their quantity increases, if the distillation is not carried on in such a manner as to prevent their being mixed with the spirit in the receiver.

Mr. Crowe's suggestions in his report to Parliament deserve the full attention of all brandy-distilling farmers, for if the stills are improved in such a way as he recommends a great portion of the fusel-oil will be separated from the brandy.

I may be allowed to repeat that the nature and the quantity of the *fusel-oil alone* make a spirit more or less objectionable from a hygienic point of view, and that there is not the slightest reason for objecting to the use of rectified potato or grain spirits instead of wine-spirit. On the contrary. With the modern appliances, which a professional distiller in Europe is compelled to use at present, for economy's sake, such spirit is produced of a greater purity than any other kind, and it is this spirit chiefly which is used

for making up not only brandies, etc., but also for strengthening wines, not on account of its cheapness only, but for the sake of its purity.

Much has been said against a practice which is universal at home, that of making up brandy by mixing it with other spirits, obtained from grain or potatoes, or by manufacturing it entirely from the latter and flavouring it by the addition of some essence.

But how can it be otherwise, when the demand for the article far surpasses the production? Since the phylloxera has made such ravages with the vines of France, the production of genuine French brandy has fallen from about 60,000 leaguers in 1875 down to 842 leaguers in 1879 and has only risen again to 2,220 in 1882. It is obvious, as Monsieur Dujardin-Beaumetz says, that a millionaire only is able to procure nowadays the genuine article for his table, and, paying even as much as a guinea for a bottle, he is not certain that he gets a really pure article.

The consumption of brandy not having decreased since that time, it stands to reason that the bulk of the article which is in the trade at present, including the favourite brands so largely used in this colony, is made up artificially. What a wonderful chance is offered here to a wine-producing country like the Cape!

But I must state at once that from a hygienic point of view—and I have here nothing to do with the commercial side of the question—this spurious brandy, made from the vile potato-spirit, is by far preferable to the genuine article as the Cape-farmer produces it at present, for the former is free from the more toxic alcohols which the latter generally contains.

It has been suggested that the evil is principally due to the want of age of our brandy. That is true to a certain extent; but never will such brandies as I have met with here, become pleasant and wholesome, even if kept for twenty years. The want of care during the fermentation of the wine and the gross negligence during its distillation impart to it such an amount of fusel-oil and empyreumatic products that no length of time can remove them.

Concluding my little paper, I feel bound to touch another side of the subject before us.

What steps should our legislature take with regard to this adulteration-question? All the greater States of Europe have found it necessary to promulgate laws against the numerous adulterations to which articles of food and drink are subjected. In principle these

various laws are similar to the British Food and Drugs-adulteration Act of 1875. They forbid not only the sale of any food or drink, which contain ingredients injurious to health, but also the sale of any such goods, which are not of the nature, substance and quality indicated by the name. They inflict comparatively high penalties on the man who sells a mixture of milk and water under the name of milk, or coffee mixed with chicory under the plain name of coffee, or oleomargarine, alias butterine, for butter. The German Supreme Court at Leipzig for instance confirmed only lately the sentence of several months' imprisonment, which a Provincial Court had passed on a spirit-dealer. And this man had done nothing but manufacture three leaguers of Jamaica-rum out of one leaquer of the genuine article. It is doubtful whether our legislature is already sufficiently impressed with the necessity of protecting our pockets against such tricks of dishonest tradesmen, but I think that it is the duty of the legislature of every country to protect the lives and the health of its inhabitants.

Some people may say that nobody is compelled to drink brandy, but we must deal with men as they are and not as they ought to be. The many efforts put forth by various governments to check the consumption of distilled liquors have thus far failed. Neither increased taxation of spirits nor severe penalties against drunkenness have availed and in spite of the strenuous efforts of the temperance societies the number of those who stick to alcoholism is immense. But if we cannot abolish the use of alcohol we can very well diminish the dreadful consequences of it by preventing the sale of a stuff which is overcharged with health-destroying ingredients, and I dare to express the hope, that the time is not very far when the sale of food and drink which are detrimental to human life will be as great a crime at the Cape as it is in London, Paris or Berlin.